NEW ORLEANS MEDICAL AND SURGICAL JOURNAL.

VOL. LII. MAY, 1900. No. 11.

Original Articles.

[No paper published or to be published in any other medical journal will be accepted for this department. All papers must be in the hands of the Editors on the tenth day of the month preceding that in which they are expected to appear. A complimentary edition of fifty reprints of his article will be furnished each contributor should he so desire. Any number of reprints may be had at reasonable rates if a WRITTEN order for the same accompany the paper.]

A NOTE ON THE INTERVAL BETWEEN INFECTING AND SECONDARY CASES OF YELLOW FEVER FROM THE RECORDS OF THE YELLOW FEVER AT ORWOOD AND TAYLOR, MISS., IN 1898.

BY H. R. CARTER, M. D., U. S. M. H. S.

When a man develops yellow fever in an uninfected place, if the conditions of his environment and of the people therein are favorable, some of the people will develop the disease (See foot note No. 1.).

A proper inquiry is of the *space of time* which intervenes between the development of the first case which infected the environment and the development of the cases contracted from this environment; and it is to give some data on this subject, observed at Orwood and Taylor, Miss., in 1898, that this note is presented.

The question set by the writer is, *how long in time in every particular instance determinable at Orwood was it between the development of a case of yellow fever in an uninfected place and the development of the next case* (and other cases) *contracted* (indirectly) *from the infection from the first case?*

There are quite a number of observations in various reports and histories of epidemics of isolated instances bearing on this subject, but no great number are so observed and so recorded as

to be beyond question reliable. Indeed, it is obvious that the conditions for reliable observation on this matter are not common. It is necessary:

(1). That the date be known of the development of the case of yellow fever which caused the infection of the environment, *i. e.*, of the "infecting case."

(2). That it be *known* that the cases accounted as contracted from the environment in question *were so contracted in fact*, *i. e.*, were not contracted from other sources, including fomites brought by the first sick man.

(3). That the exposure of these secondary cases be known to be practically continuous from the development of the first case.

Now yellow fever is essentially a disease of towns, and it is easy to see how rarely are we able to fulfil the first two conditions in a town of any size. If we *are* able to determine the first case near enough to its development to watch for the secondary cases (which does not always occur), we do not usually get more than one observation, *i. e.*, of the people contracting the fever in the house with the patient, the intercommunication of people in a town being such that after this it is difficult to certainly trace the source of infection of persons developing the fever.

Another difficulty is that observations are not usually made or records kept of a kind to determine the problem we are investigating, so that if the conditions are favorable for observation, the records do not properly preserve them.

The epidemic of yellow fever at Orwood, Miss., in 1898, was peculiarly well suited for observing this element in the propagation of yellow fever, and the record of it, which, by the courtesy of Drs. Gant and Mathews, of the Mississippi State Board of Health, I am permitted to use, was kept with particular reference to throwing light on this subject, as well as some others involved in it.

Orwood is not a town, or even a hamlet. It is a "Neighborhood." An agricultural community about *twelve miles* from the railroad at Taylor, consisting almost exclusively of white people, living on their farms, seldom closer than a mile apart, working their own lands with little hiring, having little intercourse with the outside world, practically all non-immune to yellow fever; intelligent, law-abiding and well disposed.

People who were at once intelligent enough to know, and honest enough to tell, the truth and to co-operate in good faith with the efforts made to trace the infection of each case and by stopping visiting, etc., to limit the spread of infection already introduced. This was rendered the easier, because Dr. Gant, who made the diagnosis of yellow fever, and under whom (directly or indirectly) all sanitary measures were conducted, was much beloved in the community, and had their entire confidence. The diagnosis of yellow fever was not disputed, although there were no deaths in Orwood until several weeks afterwards, and very few in all. A greater tribute to the good faith of the community, or to its confidence in Dr. Gant, can scarcely be given.

Yellow fever was introduced as follows:

(1) On August 6 by Miss Gray, four days from her uncle's house at Taylor, then infected, to "Gray Mansion." Miss Gray had been at Taylor four days and states that she brought no clothing with her save what she was wearing and one night wrapper.

(2) Ed. Gray, uncle to above, brought to the same house on August 25, from the same house at Taylor, where he had developed yellow fever four days before. Brought clothing in trunk, not open or unpacked up to September 3 (date of my first visit).

(3) Mrs. Gray, grandmother of Miss Gray, sickened en route from same house at Taylor to same house in Orwood, "Gray Mansion." Also on August 25 brought clothing with her, opened trunk day after arrival. All of these were sick in the "Gray Mansion."

(4) Mrs. Gray, daughter-in-law of Mrs. Gray, developed yellow fever en route from same house at Taylor to her house in Orwood neighborhood, on August 25, also. Her house was not the "Gray Mansion," but some miles from it. Brought furniture, bedding, etc., with her. Taylor is about twelve miles from Orwood, over a bad road, and normally there is not much communication between the places, mainly among the Grays.

We thus have yellow fever introduced from the outside into two houses in Orwood on August 6 and August 25. Almost certainly fomites were introduced (at both houses) on the 25th and

possibly on the 6th; although the history, especially the subsequent history, seems to negative this.

The "Gray Mansion" was the point of spread. This house was infected prior to the arrival of Ed. Gray and Mrs. Gray in it, as is shown by the occurrence of four or five other cases there *before* their arrival. Prior to their arrival people had been visiting at the Gray Mansion. They, the Grays, were prominent people and popular in the community. After the 25th a much larger number of people came to nurse and sit up with old Mrs. Gray and Ed. Gray and the other sick. This house was virulently infected with yellow fever of mild grade. Of forty-six people non-immune to yellow fever, who were in this house on or after the 21st of August, forty-five developed yellow fever, very few having any other exposure (See foot note No. 2).

The latter part of August, the 30th, I think, the diagnosis of yellow fever was made by Dr. Gant at the Gray house and elsewhere in the community and at Taylor as well, and visiting, save such as was necessary to care for the sick (the physicians directing this), was ordered stopped and was stopped.

We thus had at Orwood:

(1) An intelligent, well-disposed community.

(2) Living almost entirely to itself in isolated farm houses, separated far beyond the aerial conveyance of yellow fever, and with very few negro houses, or other living houses on the same farm.

(3) A definite introduction of the disease.

(4) An early diagnosis, there being then but one focus active in spreading fever from which many people had contracted it to develop it later.

(5) The cessation of visiting after the announcement of the fever, except such visiting as was known to the reporter.

(6) The almost entire absence of negroes in the community, and that none of them had so far developed the disease. Infection among negroes is confessedly difficult to trace.

Obviously it presented an ideal field for the study of "house infection" and properly studied should throw light on several problems connected with this disease, among them the subject we have mentioned.

To avail ourselves of the best advantage of the situation for

this purpose it was agreed at the instance of the writer to keep the records by "houses" and to scrutinize carefully the probable and possible exposures to infection of those developing yellow fever even after this knowledge ceased to be of any importance from a sanitary (preventive) standpoint.

With this preliminary let us examine the "house record" of Orwood. This was kept by Dr. Mathews under the auspices of Dr. Gant, much of the data being furnished by Dr. Gant. It has been compared with some notes (of the earlier cases) of my own and some of later cases, by Dr. von Ezdorf (U. S. M. H. S.), with which in this matter it agrees. Much pains has been taken to exclude doubtful statements, or to indicate that they are doubtful. I can not give the full weight to records of houses in which the cases appear late in the epidemic, as the source of infection is less certainly traced after many foci of infection are developed and the isolation has continued until it is irksome. Only those in the early part of the epidemic then will be relied on.

For the purpose of this paper, the records used as reliable are believed to be so (See foot note No. 3).

HOUSE I.—GRAY HOUSE—ORWOOD.—Sallie Wilson Gray, at Dr. Gray's, in Taylor, July 29 to August 2, at 6 P. M., developed fever, August 6, 11 P. M.; Lucille Gray, room mate of above, August 23, 11 A. M.; Annie Gray, August 24, 11 A. M.; Sam Gray, August 24, 7 P. M.; Pate Gray, August 25, 2 A. M.; Cecil Gray, August 25, 12 midnight; Christobel Gray, August 25, 7 P. M.; Ed. Gray brought home from Taylor (sick August 21) on August 25; Mrs. Charles Gray, brought home from Taylor, sickened en route, August 25; Mrs. Knox, nurse, arrived August 23, 1 A. M., sickened August 31, 2 A. M.; Mrs. McCarter, nurse, arrived August 27, 2 P. M., sickened September 1, 9 A. M.

Dr. Mathews also developed fever here five days from first exposure (four days' continuous exposure), but was not treated here.

Several others, nurses and helpers, also developed fever in this house, some being treated here and some taken elsewhere. All who lived in the house developed fever there and all save one who entered it after August 21.

Here there were sixteen and one-half days between the first

case and the second and five others within the next two and one-half days (see foot note No. 4).

All of the above to Edward Gray were continuous residents of this house from and before August 6.

Miss Gray denied that she brought any clothing or fabrics or anything whatever from Taylor, save the clothing she was then wearing on her person. Even had she done so we would scarcely accuse any such apparel, brought already infected from Taylor, as the probable cause of this outbreak. We would have expected her sister (and room mate) to have developed fever long before the boys, and certainly prior to the twenty-first day of the introduction of the already infected fomites. I think, then, there is little reason to ascribe the infection of these people to fomites brought infected from Taylor. Still, although improbable, this is possible, and if any one wishes on this account to exclude this case from the "infection of environment by the patient" he can do so. The fact remains that it was sixteen and one-half days between the development of the first and second cases (see foot note No. 5).

House No. 2.—McMillan's:—G. W. McMillan, August 29, 12 noon, exposed at Gray's; Mrs. McMillan, September 13; two sons of above, September 13.

McMillan claimed to have had only one exposure of some four and one-half hours at the Gray House (notes of writer) on Thursday, August 25, and brought nothing therefrom save the clothes he was wearing. He did not remove his coat at Gray's and wore it back to his own house. With this history, and as no one save himself sickened until the 13th of September (he sickened August 29) it is fair to consider him as the "infecting case" of the house.

The time interval is fifteen days (plus or minus a fraction of a day) and three people, all in the house, sickened within twenty-four hours.

House No. 3.—Phipps Spears:—Phipps Spears sickened August 29, 1 P. M., source of infection, Gray's; Mrs. Spears, September 18; Miss Katy Spears, September 18; Miss Bertha Spears, September 19; Laura Spears, September 22.

This gives twenty days between the first and second cases, four of which developed within five days.

HOUSE NO. 4.—CROWELL'S:—I. G. Crowell, sickened September 2, exposed at Gray's.

No other cases in this house, although there were several other people living there, non-immunes. Gives no data on this subject.

HOUSE NO. 5.—TRELOAR'S:—J. C. Treloar, August 31, 10 A. M., exposed at Gray's; Mrs. Treloar, September 1, 4 P. M., exposed at Gray's; Dorothy Treloar, September 29.

After the house was disinfected, September 26 and 28, Ruth Treloar, October 2; Jack Treloar, October 11.

Here although there were two persons sick of yellow fever in the house, both contracting it at Gray's, yet no other cases developed for twenty-nine days after the occurrence of the first, and twenty-eight days after the second case, and five out of eight non-immune children resident in the house escaped fever. What influence the disinfection had on the development of the fever, I do not know; may have been simply a concomitant; or the stirring up of things, etc., in that process may have brought some fomites into activity. The late occurrence of the last case, October 11 (in a good sized boy), for reasons before mentioned, rendered it difficult to exclude infection in this case from other sources than this house. Unrestricted visiting between houses where sickness existed was resumed in the early part of October.

Taken altogether, the data record of this house is not altogether satisfactory; if considered, its interval is twenty-nine days.

HOUSE NO. 6.—W. E. Sims, August 31, night, contracted at Gray's; H. E. Sims, September 1, 2 A. M., contracted at Gray's; Mrs. Sims, September 20; Reginald Sims, September 20; James Sims, September 20; Joe Sims, September 22; Minnie Sims, September 27.

The first two cases were contracted at Gray's, and the interval to the secondary cases is twenty or nineteen days, according as which is taken as the "infecting case." Three of the secondary cases occurred in one day, and all in the house (seven) had the fever.

HOUSE NO. 7.—FISHER'S:—Rufus Fisher, exposed at Taylor, September 3; Miss Gertie Fisher, September 26; Miss Sally Jones, September 30; Miss Mollie Fisher, September 30; Mrs.

Fisher, October 2; Ruth Fisher, October 4; Dosia Fisher, October 6.

Twenty-three days here between the first and secondary cases, of which there were six, somewhat more scattering than is usual, but all within ten days.

HOUSE No. 8.—RUFUS SPEARS:—Walter Johns, September 17, exposed at Ed. Spears'; Rufus Spears, October 8; Mrs. Spears, October 8.

Twenty-one days is the interval here. This house is probably later than should be taken, but is given by Dr. Mathews as I have recorded it.

HOUSE No. 9.—AB. JONES:—Ab. Jones, August 31, 3:30 P. M., contracted at Gray's; Mrs. Jones, September 22, 3 A. M.; Miss Edna Jones, September 22, 4 P. M.; Earl Jones, September 22, 5 P. M.; Herbert Jones, October 5, 1 P. M.; Leslie Jones, October 20, 3 P. M.

Twenty-one and one-half days between the first and next cases, three of which occurred the same day. For reasons given before the origin of infection in the case of Leslie Jones doubtful.

HOUSE No. 10.—MRS. ROGERS:—Mrs. Rogers, September 4, 10 A. M., probably contracted from Taylor; Miss Eva Rogers, September 20; Miss Della Rogers, September 22.

Sixteen days between first and second case.

HOUSE No. 11.—BERRY HARRISON'S:—Berry Harrison, September 25, probably fomites from Gray House; Mrs. Harrison, October 8.

Interval is thirteen days, but there is a chance of exposure of Mrs. Harrison to fomites after September 25.—*Unreliable.*

HOUSE No. 12.—DR. LOCKE:—Dr. Locke sickened October 1; no other cases in house.

Introduction by fomites from Taylor, second case exposed to same fomites continuously to development of fever.

HOUSE No. 13:—Only one case in house.

HOUSE No. 14:—Origin ascribed to fomites, exposure being more or less continuous thereto.

These three houses give no data bearing on the question we have set ourselves, nor indeed does house 11 give such that one can rely on.

HOUSE NO. 15.—WHITE:—W. N. White, September 2, 1:15 A. M., contracted Gray's; D. A. White, September 22, 2 P. M.

Twenty and one-half days interval, no record of number of people in house.

HOUSE 16.—RAGLAND:—Miss Pearl Ragland, August 29, 9 A. M., contracted at Gray's; J. Ragland, August 30, 12 midnight, exposed at Gray's; Miss Jane Phillips, September 9, 12 midnight.

The interval here is eleven and one-half days as the time between the development of the first and secondary cases. There were two people sick of yellow fever in this house (a small close one of one story), and as I remember, only two rooms, and there were but these three in the house when I visited. Miss Phillips, who nursed and cared for both at that time (September 4), was "anxious and overworked" (See foot note No. 6.).

HOUSE 17:—Only one case reported in the house, gives no data on this subject.

HOUSE 18.—I. B. ORR:—Langdon Orr, young man, sick August 22, 3 P. M., at Gray House on evening of August 18; Miss Maggie Orr, at Gray House, August 24 and 27, sickened August 30, 1 A. M.; Dr. Mathews brought in sick from Gray House September 3, in afternoon; I. B. Orr continuously exposed at Dr. Gray's house from August 25, sickened September 6; Miss Carrie Orr at Gray's August 25 and all night of 27, sickened September 7; James Orr, September 20; Harry Orr, September 24; Miss Bell Orr, September 27; Mrs. I. B. Orr, October 7; Lessie Orr, October 7; Miss Mary Ann Orr, October 7.

Miss Mary Orr was at the Gray House in August, and once in early September, and is the only person who visited that place after August 20, who did not develop yellow fever under such conditions that it must (most probably) be ascribed to the infection of that house. This is an extremely interesting house and my own notes on it up to and including September 4 are full. The house was a large, airy one. The family consisted of ten. They were close friends and relatives to the Grays at Orwood, and visited there although it was some miles distant. Mr. Orr and some one of the elder daughters (Maggie, Carrie and Mary) were then almost every day from the 25th on, nursing the sick, etc. Mrs. Orr, having many household cares, and the younger children did not go. The whole family had fever. Visiting

stopped when Mr. I. B. sickened, there being then four sick with fever in the house, and all who could help were needed at home. Whether Maggie Orr, Mr. Orr and Carrie Orr contracted fever from Gray's or from their own environment infected by Langdon Orr, may be a question. The writer believes that enough is known to decide in the case of the first, but it is not the purpose of this paper to use cases as secondary which may have contracted the disease elsewhere, or vice versa. It will be discussed later on.

An interval between the infecting case and the first case contracted from the infected environment can not be determined for this house.

House No. 19.—J. W. Gray:—Gives no data determinative for this subject.

House 20.—Dr. Gray:—Gives no data useful for this subject.

Taylor, Miss.—Records of the same kind, by houses, were made of the cases at Taylor, but the conditions were far less favorable.

(1) The place was almost a hamlet, some of the houses being close enough for aerial transmission of infection between them, with a common loafing place in the railroad depot and the store. The depot was infected early; whether the store was we did not determine.

(2) The fever existed quite a while, six weeks at least, before it was diagnosed, and several (four or five) foci of infection had been formed, and nearly or quite a dozen cases had occurred.

(3) There was a considerable negro population, thickly settled and mixed with the whites, of whose visiting and conveyance of fomites no one can predicate. The presence of this race introduces an element of uncertainty in tracing the propagation of yellow fever that it is difficult to overestimate.

(4) Some of the notes taken at Taylor were necessarily taken some time after the occurrences to which they refer, and thus there is question about dates and (I think) sometimes of diagnosis. There are a few houses at Taylor of which the records are definite and correct; the date being either the date of record (by Dr. Haralson or myself) or so fixed by record (of deaths, etc.) that they can be relied on. I give them:

I. House of Rev. Mr. Williams:—Twelve in family. House very clean and well kept. Isolated from others. Two colored servants.

Hampton, August 7, at night, eldest son; believed to have been exposed at Dr. Gray's. Died, with suppression and black vomit, turning very yellow, August 10. Both this death and Dr. Gray's were ascribed to "Congestion;" Grover (age 12), August 27, at night; Mrs. Williams, September 3, 8 A. M.,; Ora (24), September 4, 12 night; Lee (22), September 6, 9 A. M.,; Mark (9), September 8, at night; Sidney (17), September 9, 9 A. M.; Viva (3½), September 9, 10 A. M.; Susan Thomas (colored), September 9, during the night; Cleveland (6), September 10, at night: Nettie (26), September 15, 4 P. M.; Charles (15), September 19, 11 A. M.,: Mr. Williams, September 23, 4 to 5 A. M.; Laura Spicer (col.) September 23.

Twenty days is the interval here between the first (infecting) and secondary cases. The secondary cases, thirteen in all, followed in fairly rapid succession after they began. The children were kept out of the house as much as possible, and slept upstairs as far as possible from the sick rooms (until the latter became too numerous to be avoided) for the purpose (and we believed with the result) of delaying some of the attacks, so that all might not get sick at once. An explosion—several cases in one day—is not an uncommon occurrence in large households.

II. THE SISK HOUSES, 11 inmates:—"Two houses, 30 to 40 feet apart, practically one so far as communication is concerned until the development of fever in Mr. Jesse Sisk, communication of adults continued free after that date, Lewis Sisk and wife nursing the people in the other house. That of the children was attempted to be prevented but they go to their grandparents constantly, especially after the development of their mother's case:"

"*Jesse Sisk's*, 4 in family."—Walter Morrison, August 17, probably from Dr. Gray's; Will Sisk, September 2, night; Jesse Sisk, September 5, night; Mrs. Sisk, September 6, night.

"*Lewis Sisk's*, 6 in family and 1 colored."—Mrs. Sisk, September 7, 4 P. M.; Lewis Sisk, September 8, 10 A. M. (may have contracted this disease elsewhere); Henry Sisk (baby), September 8, 12 midnight; Sue Joiner (colored), September 12; Rodney, September 13, 10 A. M.; Charles, September 17, 1 P. M.; Paul (10), September 23, 5 P. M. (See foot note No. 7).

Sixteen days is the interval given here. The secondary cases, nine in fifteen days or ten in twenty-one days, follow somewhat

more slowly than we have seen. The children were not continuously exposed to their grandparents' house. Will Sisk was an invalid, with surgical kidney.

HOUSE III.—(Taylor Hotel).—Five in family; Captain Taylor, August 10, 4 P. M., at Dr. Gray's; Mrs. Taylor, August 11, 11 A. M., at Dr. Gray's; Clarence (colored), August 25; Guy Taylor, August 28; Mrs. Guy Taylor, September 5.

Clarence went almost everywhere and may have contracted his disease elsewhere. Fifteen days is the interval to Clarence (18 if he be held doubtful).

There are other houses recorded in the Taylor "House Record" which could be taken as probably satisfactory, but they are not certainly so. The three we have given we believe do fulfil the conditions laid down.

Grouping the results obtained, we have the following summary:

SUMMARY FOR ORWOOD AND TAYLOR.

House.	Infecting Case.	First Secondary Case.	Interval in Days.	Secondary Cases.		People in House.	Remarks.
				Number	Days.		
Orwood 1	Aug. 6	Aug. 23	16½	6	2½	(*) 7	Of 46 persons exposed, 45 probably contracted fever here.
2	Aug. 29	Sept. 13	15	3	1	(*) 4	
3	Aug. 29	Sept. 13	20	4	5	(*) 5	
6	Aug. 31 or Sept. 1	Sept. 20	19½	5	7	7	3 secondary cases occurred in 1 (the first) day.
7	Sept. 3	Sept. 26	23	6	10	(?)	
9	Aug. 31	Sept. 22	21½	4 or 5	13 or 28	6	Source of infection in last case doubtful.
10	Sept. 4	Sept. 20	16	2	2	(?)	
15	Sept. 2	Sept. 22	20½	1	.....	(?)	
16	Aug. 29 Aug. 30	Sept. 9	11½	1	.....	3	Shortest interval of the list.
Taylor 1	Aug. 7	Aug. 27	20	13	27	14	Secondary case developed in 14 days.
2	Aug. 17	Sept. 2	16	8 or 9	15	10	Paul Sisk is not rated as contracting fever at Jesse Sisk's.
3	Aug. 10 Aug. 11	Aug. 25 Aug. 28	15 or 18	3 or 2	11 or 8	5	

* All continuously resident.

The "intervals" for the twelve houses run fairly uniformly mainly from 2 to 3 weeks, one house giving less than two weeks (11½ days) and two houses more than three—21½ and 23 days respectively.

The temptation to quote instances observed elsewhere; to collate them with the result given above and to attempt to formulate the usual inferior limit (see foot note No. 8), for the time between the infecting and secondary cases is considerable, but this note was intended to give the interval of time which *did* elapse in all the houses at Orwood and Taylor between the first case of yellow fever and those believed with reasonable certainty to have developed yellow fever from infection brought to the house by the first case.

This ends our note, but it is judged best to give an appendix of the records of *all* the houses in Orwood (although some give no determinative information on this subject). The reader can judge for himself whether there was any improper selection of houses; if any were omitted which should have been taken in the foregoing table or taken which should have been omitted. For Taylor this is not possible, some of the data being not only indeterminate but unreliable. Those given for Taylor are all of which the writer has satisfactory record and which he believes to fulfil the required conditions.

FOOT NOTES.—No. 1. It is assumed that the infection of yellow fever may be conveyed directly from one sick of that disease to his environment, it being so generally admitted that it seems a waste of time to argue it; but the data recorded in this paper do not depend on or involve this theory or indeed any theory. They are simply facts that were observed.

No. 2. This house was a frame house, old, but sound and well preserved, on the top of a considerable hill, well exposed to sun and wind, and, as far as I could judge, as clean and the premises as well kept as country houses of the better class usually are; although at the time I saw it, there being then seven cases of yellow fever in it, and one very ill, it was probably less well cared for than usual. The privy was distant from the house, and clean. I did not, however, give the place a close sanitary examination.

No. 3. Far more important than to determine the time between infecting case and secondary cases (or the inferior limit

of this time) is to determine the limits of the period of incubation of yellow fever in one contracting it and the period of "house infection" or so-called extrinsic incubation (which of course are involved in the problem set ourselves). It will be recognized that the conditions at Orwood, and to a less degree at Taylor, were extremely well suited for the study of the former problems, and indeed the observations there are for this purpose extremely valuable; but as the writer has been collecting data on this subject since 1887, it seems better to collate these (Orwood and Taylor) observations with the others when time and convenience permit the work receiving the care it deserves.

No. 4. Langdon Orr, who very probably (almost certainly) contracted his sickness from this house, was also sick at this time. (See House No. 18). He sickened August 22. To him the "interval" would be 16 days. Note that he developed the fever before Miss Lucille.

No. 5. When the source of infection of a household is fomites, we generally observe several cases developing about the same time, without the long interval between the first and other cases. Of course, the times of exposure to the fomites of different members of the household and individual susceptibility may be such as to make any variation in the dates of development. The statement, however, is *generally* true.

No. 6. Compare with a case at Jackson, Miss., 1899: "Mr. H. developed yellow fever October 20, in early morning; Mrs. H. developed yellow fever October 30, at night. Interval 10½ days."

No other non-immunes in the house, children having been sent away. Mrs. H. did not leave the premises, scarcely the sick room and the one adjacent, from the date Mr. H. became sick. Mr. H. was exceedingly ill and Mrs. H. was under severe strain, moral and physical. He was treated on the ground floor and the room was kept dark, the weather being intensely hot. Mrs. H. slept (when she slept) in adjoining and communicating room. No attempt at sanitary precautions in the house. Mrs. H. was from mountainous district in Virginia.

We might (from analogy) consider that the conditions here and at Ragland were favorable for an early infection of the premises and for lowered resistance of the one exposed, and

thus (with the intimate exposure) favor an early development of the secondary case, and thus explain the fact that these two "intervals" are shorter than usually observed. The writer is not inclined, however, to offer any explanation; the conditions which affect house infection and individual susceptibility are not sufficiently known to theorize on them.

No. 7. Up to September 10, and doubtless afterward, this boy (age 10) was being kept away from his grand-parents' premises, where all were very ill (two of them dying), to keep from disturbing them. He most probably contracted his fever at home, from Lewis Sisk's premises.

No. 8. Obviously only the inferior limit is in question. A place may be infected and a person live in it an indefinite time without contracting yellow fever, the time depending on individual susceptibility (temporary or permanent) and other causes.

Individual susceptibility is a factor as well in determining the time of development of the first secondary case, and thus in determining our "interval." But where there are many who develop yellow fever in a house (as at Gray's and Williams') its influence is lessened. It is not reasonable to suppose the individual susceptibility of every one of a considerable number of peo ple, developing yellow fever, to be less (or much less) than the normal.

APPENDIX I.

Houses in Orwood not considered as giving data suitable for subject of this note.

House 4, Crowell's, in which no cases developed following the first case, September 2, although there were several (certainly 3) non-immunes resident there. Has been mentioned.

House 5, Treloar's, ten in family, has also been discussed at length. It would probably be honest to count this house as giving an "interval" of twenty-nine days.

House 11, Berry Harrison's, number in family (?) Berry Harrison sickened September 25. Father spent evening at Gray place August 27, and hung the clothes he wore in a closet with some feather beds. Closet was not opened until a few days before Berry was taken sick. On September 14 Berry bought sugar and pair of shoes at Tatum's store, then supposed to be infected.

Mrs. Harrison sickened October 3. *If* the first case contracted the disease in the manner implied by the reporter (one does not know enough of the circumstances to form any conclusions), the second case may well have been exposed to the same source of infection at any time from opening of the closet to date of her sickness.

The record of this house then gives nothing determinative for our subject.

House No. 12, Tatum's store: Mr. Tatum bought goods from Taylor's depot, August 24 and August 29; Mrs. Tatum, sick September 29; Mr. Tatum, sick October 4; Eva Tatum, sick October 13.

Whether the infection was introduced in the way stated may be a question; it is possible. If so who can say if the other cases were from exposure to the Taylor fomites (or other fomites) or to infection of the house of the first case?

House No. 13, J. S. Locke: Dr. Locke, October 1, exposed at Fishers. No other cases.

House No. 14.—J. T. Reeves: J. T. Reeves, sick October 5, without other known exposure than possibly the following: A shaggy house dog went back and forth from Phipps Spears' house (House No. 3) to Reeves' house and slept on chairs, beds, etc., at both places. Phipps Spears went to Reeves' house September 14 and talked with him but did not go in; J. T. Reeves, October 5; Mrs. Reeves, October 5; Clarence Reeves, October 8; Alice Reeves, October 15; Earnest Reeves, October 16.

Without discussing the etiology, which, if somewhat startling, is probable enough, there being no evidence to show that the first cases contracted the disease elsewhere save from fomites in their own house; it would be impossible to determine if the others were in a true sense secondary cases to the first.

The picture of the infection is certainly that of infection by fomites, or at least common infection for all. Notice the lack of considerable interval. Independent of history it is too late in season to be used.

House 17.—Dennis Caruthers, exposed in Gray House, sickened September 10th, 2 A. M., no record of any other cases in his house, but no statement that there was none other.

House 19.—J. W. Gray's: Miss Blanche Gray, August 27. Contracted at Dr. Gray's. House disinfected September 18. Subsequently no one was permitted to go in or out except the fumigators, who boarded there and went back and forth from Dr. von Ezdorf's tent, 40 yards distant, who sickened (with yellow fever) September 27, and was there treated.

J. W. Gray, October 8, 1 P. M.; N. D. Gray, October 9, 10 A. M.; Pat Gray, October 10, 8 A. M.; Mrs. J. W. Gray, October 14, 2 A. M.; Robert Gray, October 18, 11 A. M." (Mathews' notes.)

Without discussing the probable source of infection of the last five persons, it is obvious that considering the lateness of the season, and consequent general diffusion of the disease in the neighborhood, the presence of the "fumigators"; the existence of a case of yellow fever within forty yards; together with the impossibility of preventing five people, four of them men and boys, from going out for three weeks, we can not be satisfied that they were infected from the environment infected by Miss Blanche Gray; if the disinfection was efficient it certainly was not.

This house, then, gives us no data which we can use for the subject in hand. The probability is that this house escaped infection from the first case, and that either fomites were introduced prior to October 8, or that the last five cases were exposed to a common extraneous source of infection. The picture would be the same in each case, and would correspond with what we have.

House No. 20—Mrs. Dr. Gray's: Mrs. Dr. Gray sickened on the road from Taylor, 10 A. M., August 25. All her children, three in number, had been sick at Taylor. There were naturally no cases at this house. The moving was general, her bedding, furniture, etc , coming also. No infection in Orwood is ascribed to this house.*

APPENDIX II.

House No. 18, Orwood. We propose to further discuss the propagation of yellow fever at house No. 18, Mrs. Orr's:

*If my recollection be correct, this house was close to house No. 19, and Mr. J. W. Gray and his sons attended to the comfort of this family and their affairs generally, and I had suspected, although I have no direct evidence, that the infection of this household in October was from this source. It is difficult to be careful for a long time, especially when few died.

Note that all those who sickened before September 20, had been exposed at the Gray House, a badly infected place; that none of those who had not been there exposed (at the Gray House), sickness prior to September 20.

Note also the considerable interval, thirteen days, between the development of the last case exposed at the Gray House and the first case not so exposed, and that the intervals between the cases known to be contracted from infection at Orr's house is much less.

From this alone I think we would be justified in saying that it is most probable that the cases arising prior to the 20th were contracted at the Gray House, and those from that date at Orr's. Orr's house being infected by some of the preceding cases.

If, in addition to this, we compare this house with all the others we have recorded, we find that none of them show so short a time as seven and a half days between the infecting and secondary cases, and unless Maggie Orr's case was to that extent exceptional, it was not a secondary case, and therefore not contracted from infection of this residence by Langdon Orr.

The same can not be said of the next two cases, 15 and 16 days respectively from the first. There are intervals which we have observed. The intervals of development September 6, 7, 20, 24 and 27 of the whole group do not correspond with what we have seen of secondary cases in other Orwood houses. While the group from the 20th on does so correspond.

The conclusion the writer would reach is that Miss Maggie Orr contracted her fever at Gray's; that it is highly probable that Mr. Orr and Miss Carrie Orr did also, and that only the cases from the 20th on were contracted from the infection of Orr's house; infected by some (it need not have been Langdon) of those who were sick in it.

APPENDIX III.

Obiter Dictum.—Broadly the question to be considered, and to which the data in the preceding paper may be contributory is this: *Is the time between the development of the case which infects its environment and the next other cases contracted therefrom* (i. e. from the environment) *usually so definite that a general statement of the limits of this time can be made?*

So far as the writer knows this (general) subject is not dis-

cussed in any systematic treatise on yellow fever, yet it is alluded to in several brochures and is now recognized (at least as a general working hypothesis) by many who have observed the spread of yellow fever in places where it is not endemic.*

The time from the infecting to a secondary case obviously consists of three periods:

(1) The time from the development of the infecting case to the time the environment is capable of developing infection in other men, plus

(2) Time the individual in question is exposed to the environment before he contracts the disease, plus

(3) Time from the date of contracting the disease to its development in him.

In the general case all three are variants and, while this "time" includes all three, by itself it would give us little chance of determining any one of them. It may, however, be made a factor in that determination if we have other data.

It is exceedingly desirable from a practical standpoint to determine the limits of the "period of incubation" of yellow fever and it was on this subject that the writer was engaged (since 1887), when he was impressed with the general uniformity of time interval between first and secondary cases in a number (5) of instances. Inquiry of more experienced observers showed that the phenomenon had been observed by others, and while further observation and inquiry showed that the uniformity first observed (16 to 18 days) was accidental and closer than was generally found, yet there is much evidence to show that it is usually "in the third week" (Jno. Wall of Tampa), or better, "usually *not prior to the third week*" that secondary cases develop.

It is the belief that the secondary cases follow immediately on the infecting case that causes the laity to doubt (generally to deny) the diagnosis of yellow fever, "because it has been ten days and no case has developed among the family."

The sanitarian can not take this comfort to his soul (it would be a comfort to him were he the discredited diagnostician him-

* Maximilian Corre, who does not believe that a man sick of yellow fever can infect his environment, *regarding the disease as a toxemia, not an infection*, probably has something on this subject, as there is an allusion to a subject involved in the "Extrinsic Incubation" of yellow fever in one of his lesser works. The writer has been unable to see the work alluded to (also one of Corre's) and at present has access only to his own notes.

self), or that which springs from the hope that the case did not infect its surroundings until a much longer time has elapsed. There is, of course, no definite limit of time at which we would call the situation "safe," or "unsafe," but hope of safety increases with the passage of the third week, and as the time beyond this passes.

This law (one will admit it at least as a working hypothesis) is also of value in predicting the progress of an epidemic which will spread. From the first (infecting) case to the first group of cases, infected at his house, is generally from two to three weeks. These form new foci (the original one remaining active), and in from two to three weeks more the second group of cases appears. At this time, four to six weeks, the fever should be "scattered" in tertiary foci, just beginning. Prior to this it is found *only in those who have had a common exposure*, seldom then in more than four to eight places, although it is not the number, but the common exposure, that is in question.

CLINICAL OBSERVATIONS ON HEROIN AND HEROIN HYDROCHLORIDE, AS COMPARED WITH CODEIN AND MORPHIN,

By Dr. F. C. Floeckinger, La Grange, Texas.

Among the narcotic alkaloids, opium and its derivatives occupy incontestably the first place. Of the 17 alkaloids and the other allied combinations which have no decided basic properties, morphin and codein are chiefly employed in medical practice and have become indispensable to the physician.

Aside from the after-effects of morphin, such as nausea, general lassitude, vomiting and vertigo, this preparation has the disadvantage that the patient becomes readily addicted to it, and chronic morphinomania occurs especially in neurotic persons. This is less common in Germany and Austria where the sale of morphin is under the control of the State than in the United States where no such monopoly exists.

Codein in its physiologic action resembles narcotin, but the narcotic stage is not so much pronounced. When administered in small doses intestinal peristalsis is promoted, while in large doses it produces diarrhea in consequence of complete relaxation of the intestinal muscles, owing to paralysis of the nerve